Statement of Basis

Title V Air Quality Permit Renewal

NuGen Energy, LLC – Marion, South Dakota

South Dakota Department of Environment and Natural Resources

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1.0 Background

On July 7, 2006, the Department of Environment and Natural Resources (DENR) issued a Title V air quality permit to NuGen Energy, LLC (NuGen), for a dry corn mill ethanol production plant located near Marion, South Dakota. DENR revised the permit on:

- October 4, 2007 – Administrative Amendment to revise the facility name, mailing address, and contacts;
- May 12, 2009 – Administrative Amendment to revise the facility name;
- August 17, 2009 – Administrative Amendment to revise facility name, mailing address, permit contact, and responsible official; and
- May 13, 2010 – Permit Modification to increase ethanol production, grain processing, DDGS production, ethanol load out and hours of operation for the biomethanator flare. Revise the operating rates for the cooling drum, distillation process, DDGS dryers and fermentation process.

NuGen submitted applications for the renewal of its Title V air quality permit on January 10 and February 10, 2011. At full capacity, the facility processes up to 40 million bushels of corn per year and produces up to 122 million gallons of 200-proof ethanol, which is sometimes referred to as undenatured ethanol, per year. NuGen also produces dried distillers grain and solubles (DDGS) as a saleable byproduct.

2.0 Operational Description

2.1 Existing Equipment

Table 2-1 provides a description of the permitted units, which was derived from the existing permit.

Table 2-1 – Description of Permitted Units, Operations, and Processes

Identification	Description	Maximum Operating Rate	Control Device
Unit #1	Grain receiving, grain transfer, and storage bin loading. Trucks and railcars transport grain to the ethanol plant and dump grain into a receiving pits located in a partially enclosed building. Elevator legs transport the grain from the receiving pit to grain storage bins. Each leg has a capacity of 18,000 bushels/hour	420 tons of grain per hour	Baghouse
	Elevator legs transport the grain to a day bin by a conveyor and elevator leg	168 tons of grain per hour	

Identification	Description	Maximum Operating Rate	Control Device
Unit #2	Grain milling. The grain is transferred from the day bin to one of four hammer mills where the grain is milled into flour.	42 tons of grain per hour (each hammer mill)	Baghouse
	An elevator leg transfers the flour to the fermentation process	168 tons of flour per hour	
Unit #3	Fermentation system. Ethanol is produced from the fermentation process. The fermentation process occurs in seven fermenters and the liquid beer is stored in a beer well.	91,500 gallons of mash per hour	Wet scrubber.
Unit #4	Four DDGS dryers. The distillers grain and solubles is dried in two dryer systems. Each dryer system is comprised of two dryers operated in series. Each dryer has a multi cyclone to collect product and is fired on natural gas. A combination of flue gas recirculation and low NOx burners will be installed on the dryers and thermal oxidizer.	Each dryer has a heat input capacity of 46.5 million Btus per hour and processes 42 tons of DDGS per hour.	Two thermal oxidizer heat recovery boiler systems. Each thermal oxidizer has a maximum operating rate of 122 million Btus per hour heat input. A combination of flue gas recirculation and low NOx burners will be installed on the dryers and thermal oxidizers.
	The thin stillage and solids fractions of the wet distillers grain and solubles are separated by six centrifuges		
	Distillation process. The distillation process distills the liquid beer. The distillation process consists of the beer stripper, rectifier, side stripper, molecular sieve, condensers, and evaporators.	14,400 gallons of ethanol produced per hour.	
	Process vent mixer, cook water tank, centrate tank, and yeast tank		
	Biomethanator. Methane produced by the biomethanator is either routed to Unit #7 or the DDGS dryers.		

Identification	Description	Maximum Operating Rate	Control Device
Unit #5	Cooling drum. A cooling drum cools the dried distillers grain.	46.5 tons of dried distillers grain per hour	Baghouse. A portion of the exhaust gases may be passed through the DDGS dryer(s) in Unit #4
Unit #6	Dried distillers grain silo	500 tons of dried distillers grain per hour	Baghouse
Unit #7	Submerged truck loading rack	36,000 gallons of denatured ethanol per hour.	A flare. The flare has an operating rate of 12.4 million Btus per hour heat input
	Rail car loading rack	120,000 gallons of denatured ethanol per hour	
Unit #8	Biomethanator Flare. Methane produced by the biomethanator is either routed to Unit #4 or the biomethanator flare.	6.4 million Btus per hour heat input	Not applicable
Unit #9	Fire Pump. The fire pump is fired on distillate oil.	300 horsepower (~ 2.5 million Btus per hour heat input)	Not applicable
Unit #10	Industrial cooling tower	Not applicable	Not applicable
Unit #11	Tank #1 – An above ground storage tank with an internal floating roof. The tank will store ethanol.	200,000 gallons	Not applicable
Unit #12	Tank #2 – An above ground storage tank with an internal floating roof. The tank will store ethanol.	200,000 gallons	Not applicable
Unit #13	Tank #3 – An above ground storage tank with an internal floating roof. The tank will store gasoline.	200,000 gallons	Not applicable
Unit #14	Tank #4 – An above ground storage tank with an internal floating roof. The tank will store denatured ethanol.	1,500,000 gallons	Not applicable
Unit #15	Tank #5 – An above ground storage tank with an internal floating roof. The tank will store denatured ethanol	1,500,000 gallons	Not applicable

2.2 Proposed Revisions

On January 10, 2011, DENR received an application from NuGen to renew its existing Title V air quality permit and make the following corrections:

- Revise the grain receiving/processing rate from 420 tons per hour to 1,008 tons per hour. NuGen's application states the initial permit listed the facility with a total capacity of 15,000 bushels per hour (420 tons per hour). However, the facility actually has two grain receiving legs, each with a capacity of 18,000 bushels per hour (504 tons per hour). NuGen is requesting that the renewal permit lists the capacity at 36,000 bushels per hour or 1,008 tons per hour; and
- Revise the facility name from NuGen Marion Energy to NuGen Energy, LLC.

The application was considered complete on February 8, 2011. Additional information was received from NuGen on February 10, 2011.

3.0 Emission Calculations

3.1 Emission Estimates

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) and Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017) documents, the applicant's original application, or other methods to determine potential air emissions.

3.2 Potential Controlled Emission Limits

NuGen requested federally enforceable conditions and operational restrictions be placed in the existing Title V air quality permit to avoid the Prevention of Significant Deterioration (PSD) permit program. The short term emission limits in Table 3-1 were derived from the existing Title V air quality permit issued May 13, 2010.

Table 3-1 – Short Term Emission Limits from Existing Title V Air Quality Permit

Unit	Description	PM10 (lbs/hr)	SO_2 (lbs/ton)	NO_x (lbs/hr)	VOCs (lbs/ton)	CO (lbs/ton)
#1	Grain handling	2.1				
#2	Hammer mills	1.2				
#3	Fermentation				850 [1]	
#4	DDGS Dryers	0.12	0.45	18.8	0.13	0.45
#5	DDGS Cooling Drum	0.6				
#6	DDGS Grain Silo	0.4				

[1] – The units for the fermentation process is in pounds per million gallons produced.

NuGen's permit contains the following enforceable emission limits:

- Emit less than or equal to 95 tons of particulate matter less than or equal to 10 microns in diameter (PM10) per 12-month rolling period;
- Emit less than or equal to 95 tons of volatile organic compounds (VOCs) per 12-month rolling period;
- Emit less than or equal to 95 tons of sulfur dioxide (SO_2) per 12-month rolling period;
- Emit less than or equal to 95 tons of nitrogen oxide (NOx) per 12-month rolling period;
- Emit less than or equal to 95 tons of carbon monoxide (CO) per 12-month rolling period;
- Emit less than or equal to 9.5 tons of a single hazardous air pollutant (HAP) from permitted units and fugitive sources per 12-month rolling period; and
- Emit less than or equal to 23.8 tons of a combination of HAPs from permitted units and fugitive sources per 12-month rolling period.

NuGen also has the following enforceable operational limits:

- Restricts operation of Unit #8 to 4,790 hours or less per 12-month rolling period;
- Restricts the quantity of denatured ethanol load out by truck (Unit #7) to 42.7 million gallons or less per 12-month rolling period;
- Restricts operation of Unit #9 to 300 hours or less per 12-month rolling period;
- Restricts production to 122 million gallons of undenatured ethanol or less per 12-month rolling period;
- Restricts the process rate to 1,242,000 tons of grain or less per 12-month rolling period; and
- Restricts production to 395,810 tons of dried distillers grain or less per 12-month rolling period.

NuGen is not proposing any changes to the short term or long term limits or the operational limits. Therefore, these limits will be included in the draft permit. In addition, short term and a long term limit of 95 tons per 12-month rolling total will be placed in the permit for particulate matter 2.5 microns in diameter or less.

DENR reviewed the initial stack tests, additional stack tests, continuous emission monitoring data, and reports and determined NuGen is capable of meeting the short term limits, long term limits, and operational limits.

4.0 Permit Requirements

4.1 New Source Review

ARSD 74:36:10:01 notes that new source review regulations in this chapter apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. NuGen is located near Marion, South Dakota, which is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, NuGen is not subject to new source review requirements in this chapter.

4.2 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated pollutant. The following is a list of regulated pollutants under the PSD program:

- Total suspended particulate (PM);
- Particulate with a diameter less than or equal to 10 microns (PM10);
- Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
- Sulfur dioxide (SO2);
- Nitrogen oxides (NOx);
- Carbon monoxide (CO);
- Ozone – measured as volatile organic compounds (VOCs);
- Lead;
- Fluorides;
- Sulfuric acid mist;
- Hydrogen sulfide;
- Reduced sulfur compounds; and
- Total reduced sulfur.

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated pollutant. The major source threshold for all other sources is 250 tons per year of any regulated pollutant.

EPA recently published and implemented a final rule that no longer lists ethanol plants as a chemical manufacturing plant. Therefore, NuGen is not classified as a chemical manufacturing plant or one of the 28 listed source categories for PSD regulations, which changes the major source threshold for the facility to 250 tons per year.

NuGen existing permit contains enforceable permit conditions to ensure actual emissions from the ethanol plant do not exceed the major source threshold under the PSD program, except for PM2.5. NuGen did not request any changes to the existing enforceable limits; therefore, the existing enforceable limits will be included in the draft permit along with enforceable limits for PM2.5 emissions. With the enforceable limits in place, NuGen is not subject to the PSD program.

4.3 New Source Performance Standards

DENR reviewed the New Source Performance Standards under 40 CFR Part 60 and determined the following subparts may be applicable to NuGen.

4.3.1 ARSD 74:36:07:17 – 40 CFR, Part 60, Subpart DD

The provisions of the standards of performance for grain elevators are applicable to the following grain elevators:

1. The provisions of this subpart are applicable to any grain terminal elevator, which has a permanent grain storage capacity of 2,500,000 bushels. A grain terminal storage elevator means any grain elevator except those located at animal food manufacturers, pet food manufactures, cereal manufacturers, breweries, and livestock feedlots; or
2. The provisions of this subpart are applicable to any grain storage elevator, which has a permanent grain storage capacity of 1,000,000 bushels. A grain storage elevator means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant; and
3. Commences construction, modification, or reconstruction after August 3, 1978.

NuGen is considered a grain terminal elevator. The permanent grain storage capacity for this plant is less than 1,000,000 bushels, which is less than 2,500,000 bushels. Therefore, this subpart does not apply to NuGen.

4.3.2 ARSD 74:36:07:14 – 40 CFR, Part 60, Subpart Kb

The provisions of this subpart are applicable to each storage vessel with a capacity greater than or equal to 75 cubic meters that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 cubic meters storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals or with a capacity greater than or equal to 75 cubic meters but less than 151 cubic meters storing a liquid with a maximum true vapor pressure less than 15.0 kilopascals. See Table 4-1 for tank size and the true vapor pressure of the liquids being stored in the tanks

Table 4-1 – Tank and Volatile Organic Liquid Specifications

Tank	Capacity		True Vapor Pressure	Subpart Kb Applicable
	Gallons	Cubic meters	Kilo Pascal	
#1	**200,000**	757	5.4	Yes
#2	**200,000**	757	5.4	Yes
#3	**3,000**	11	1	No
#4	**200,000**	757	35	Yes
#5	**1,500,000**	5,678	5.5	Yes
#6	**1,500,000**	5,678	5.5	Yes

Tank #1, #2, #4, #5 and #6 have a capacity greater than 151 cubic meters and have a maximum true vapor pressure greater than 3.5 kilopascals. Therefore, Tank #1, #2, #4, #5 and #6 are subject to this subpart. Tank #3 is less than 75 cubic meters and is not subject to this subpart.

NuGen met the notification requirements and the initial notification and inspection requirement before filling each tank for Tank #1, #2, #4, #5 and #6. NuGen installed a fixed roof with an

internal floating roof to comply with this subpart. Therefore, the permit conditions will be specific to the requirements associated with a fixed roof and internal floating roof and include the requirements in the following sections of this subpart:

1. § 60.112b(a)(1);
2. § 60.113b(a)(1), (2), (3), (4), and (5);
3. § 60.115b(a)(2), (3), and (4); and
4. § 60.116b(a), (b), and (c).

4.3.3 ARSD 74:36:07:22 – 40 CFR Part 60, Subpart VV

The provisions of this subpart is applicable to affected facilities in the synthetic organic chemicals manufacturing industry, of which ethanol is included; and commence construction or modification after January 5, 1981. Any facility with the design capacity to produce less than 1,000 megagrams per year is exempt from this subpart. NuGen produces 122 million gallons of ethanol per year. The specific gravity of ethanol equals 0.789. Equation 4-1 was used to convert from gallons per year to megagrams per year for NuGen.

Equation 4-1 – Conversion to Megagrams per Year

$$\text{NuGen} = 122{,}000{,}000\frac{gallons}{year} \times 8.33\frac{pounds}{gallon} \times 0.789 \times 0.00045\frac{megagrams}{pound}$$

= 360,820 Mega grams per year

This subpart is applicable to NuGen because construction started after January 5, 1981 and before November 7, 2006, and the capacity of the plant is more than 1,000 megagrams per year of ethanol. The initial notification and demonstration of compliance has been completed. The remaining requirements applicable to NuGen will be included in the permit.

4.3.4 ARSD 74:36:07:22.01 – 40 CFR Part 60, Subpart VVa

The provisions of this subpart apply to affected facilities in the synthetic organic chemicals manufacturing industry that commence construction, reconstruction, or modification after November 7, 2006. Any affected facility that has the design capacity to produce less than 1,000 megagrams per year (1,102 tons per year) of a chemical listed in 40 CFR § 60.489 is exempt from §§ 60.482–1a through 60.482–11a. NuGen completed construction prior to November 7, 2006. Therefore, this subpart is not applicable.

4.3.5 ARSD 74:36:07:05 – 40 CFR, Part 60, Subpart Db

The standards of performance for industrial, commercial, and institutional steam generating units are applicable to the following:

1. Each steam generating unit for which construction commenced after June 19, 1984; and
2. The steam generating unit has a heat input capacity greater than 100 million Btus per hour.

The two thermal oxidizers, each rated at 122 million Btus per hour, provide steam for the ethanol plant through a heat recovery boiler system. The thermal oxidizer/heat recovery system was constructed after June 19, 1984, and has a heat input capacity greater than 100 million Btus per hour. Therefore, this rule is applicable to this boiler system.

In accordance with 40 CFR § 60.42b(k)(2), units firing only very low sulfur oil, gaseous fuel, a mixture of these fuels, or a mixture of these fuels with any other fuels with a potential sulfur dioxide emission rate of 140 nanogram per Joules (0.32 pounds per million Btus) heat input or less are exempt from the sulfur dioxide emissions limits. NuGen is firing the thermal oxidizers with just natural gas which has a potential sulfur dioxide emission limit less than 0.32 pounds per million Btus. Therefore the units are not subject to the sulfur dioxide emission limit. In addition, NuGen does not have to meet the particulate matter emission limit associated with Subpart Db because the limits are associated with the consumption of coal, oil, wood, etc.

NuGen is required to meet a nitrogen oxide limit (expressed as nitrogen dioxide). In the original review, the thermal oxidizers were determined to have a "low heat release rate" and subject to a 0.10 pounds per million Btu nitrogen oxide emission limit based on 40 CFR § 60.44b(l)(2). The section was used because the thermal oxidizers burn waste gases besides natural gas. It was assumed the heat input value for the waste gas was minimal which results in the right side of formula being zero.

NuGen is required to meet the following sections for this subpart:

1. § 60.44b(f), (h), (i), and (l)(2);
2. § 60.46b(c) and (e)(1) and (4);
3. § 60.48b(b)(1), (c), (d), (e)(2), (f), and (g);
4. § 60.49b(a)(1), (b), (g), (h)(2) and (4), (i), (o), and (w);
5. § 60.7(a)(1), (3), (4), and (5), (b), (c), (d), and (f);
6. § 60.8(a), (b), (c), and (d);
7. § 60.12; and
8. § 60.13(a), (b), (d)(1), (e)(2), and (f).

4.3.6 ARSD 74:36:07:88 – 40 CFR Subpart IIII

The provisions of this subpart are applicable to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that meet one of the following:

1. Manufacturers of stationary CI ICE with a displacement of less than 30 liters per cylinder where the model year is 2007 or later for engines that are not fire pump engines or model year 2008 or later ofr engines that are fire pump engines;
2. Owners or operators of stationary CI ICE that commence construction after July 11, 2005 where the CI ICE is manufactured after April 2, 2006 and is not a fire pump engine or manufactured as a certified National Fire Protection Association fire pump engine after July 1, 2006; or
3. Owners or operators of stationary CI ICE that modified or reconstructed their stationary CI ICE after July 11, 2005.

NuGen operates a 2007 fire pump engine rated at 300 horsepower and combusts distillate oil. The fire pump engine meets the applicability requirement of subparagraph 2 above and is applicable to this subpart.

In accordance with 40 CFR § 60.4204(c), the owner or operator of a fire pump engine with a displacement of less than 30 liters per cylinder must comply with the requirements in Table 4-2. Based on additional information received from NuGen, the fire pump engine has 6 cylinders and a displacement of 496 cubic inches or 8.1 liters. Therefore the displacement for this fire pump engine is 1.4 liters per cylinder and the fire pump engine must meet the requirements in Table 4-2.

Table 4-2 – Emission standards for fire pump engine [1]

NMHC + NOx	CO	PM
10.5 grams/Kilowatt-hour (7.8 grams/horsepower-hour)	3.5 grams/Kilowatt-hour (2.6 grams/horsepower-hour)	0.54 grams/Kilowatt-hour (0.40 grams/horsepower-hour)

1 – NMHC + NOx means non methane hydrocarbon plus nitrogen oxide, CO means carbon monoxide, and PM means particulate matter.

The permit shall include the following sections Subpart IIII:

1. 40 CFR §60.4205(c);
2. 40 CFR §60.4206;
3. 40 CFR §60.4207(b);
4. 40 CFR §60.4211(b);
5. 40 CFR §60.4212; and
6. 40 CFR §60.4212(d).

4.4 National Emission Standards for Hazardous Air Pollutants

DENR reviewed the National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 61 and determined that the following may be applicable to NuGen.

4.4.1 40 CFR, Part 61, Subpart FF – Benzene Waste Operations

Previously, DENR considered a few ethanol plants applicable to 40 CFR, Part 61, Subpart FF – National Emission Standard for Benzene Waste Operations. The applicability was primarily based on ethanol plants being considered a chemical processing plant based on its Standard Industrial Classification Code 2869 – Industrial Organic Chemicals – Not Elsewhere Classified. In a May 1, 2007, federal register notice, EPA finalized a rule that identified ethanol plants were not considered chemical processing plants.

The May 1, 2007, federal register notice finalizes proposed changes to the definition of ‘‘major emitting facility’’ in the Prevention of Significant Deterioration (PSD), Nonattainment New Source Review (NSR) and Title V air quality permit regulations in regards to what facilities are

considered a chemical processing facility. This notice identifies the change does not affect applicability for other Clean Air Act requirements. In particular EPA notes on page 24067 that "The applicability of differing rules is standard-specific and determinations were made under individual rulemakings and will not be changed under this rulemaking. There is no directive for the applicability to be the same across CAA programs and standards and applicability determinations need to be determined on a case-by-case, or standard-by-standard, basis."

EPA notes two specific items in this rule making: 1) On page 24063, EPA specified that it "did not believe that the term ''chemical process plant'' is subject to a ''plain meaning interpretation.'' There is not a universally accepted definition of chemical process, and accepted definitions differ depending on whether you view the term from a purely scientific sense or from an engineering sense, or for economic purposes." 2) EPA specifies several new source performance standards and national emission standards for hazardous air pollutants that were potentially applicable to an ethanol plant. However, 40 CFR, Part 61, Subpart FF was not one of the listed standards that were considered potentially applicable to an ethanol plant.

The provisions 40 CFR, Part 61, Subpart FF applies to chemical manufacturing plants, coke byproduct recover plants, and petroleum refineries. Chemical manufacturing means any facility engaged in the production of chemicals by chemical, thermal, physical, or biological processes for use as a product, co-product, by-product, or intermediate including but not limit to industrial organic chemicals, organic pesticide products, pharmaceutical preparations, paint and allied products, fertilizers, and agricultural chemicals. Examples of chemical manufacturing plants include facilities at which process units are operated to produce one or more of the following chemicals: benzenesulfonic acid, benzene, chlorobenzene, cumene, cyclohexane, ethylene, ethylbenzene, hydroquinone, linear alklylbenzene, nitrobenzene, resorcinol, sulfolane, or styrene.

Ethanol is a chemical that is produced by a biological process (fermentation). However, ethanol is not one of the listed chemicals specified by definition. Therefore, just by the definition it appears this subpart is not applicable to ethanol plants.

In EPA's September 14, 1989, federal register proposed rulemaking notice, EPA stated that "Although EPA's analyses focus on chemical plants, petroleum refineries, coke by-product recovery plants, and commercial TSDF's, any standards placed on benzene waste operations would be applicable to any waste containing benzene." In EPA's December 15, 1989, federal register proposed rule clarification notice, EPA stated that "The proposed rule is intended to apply only to benzene wastes from chemical plants, petroleum refineries, coke by-product recovery plants, and commercial hazardous waste treatment, storage, and disposal facilities. Coverage of these industry categories is consistent with the background information used as the basis for the proposed rule". In addition, in EPA's March 5, 1992, federal register proposed rule notice, EPA state that "In the analysis performed to support the development of subpart FF, EPA determined that the NESHAP risk protection goals could be exceeded if benzene emissions from benzene waste operations were not controlled. Rather than require all facilities to install controls, EPA structured the applicability criteria of the rule in a way that would identify that subset of facilities where controls were needed." The preambles indicate EPA intended for all benzene waste streams at all chemical manufacturing facilities to be covered by this regulation.

However, this does not specify what is considered a waste or a benzene waste stream. In accordance with 40 CFR § 61.341, waste is defined as "any material resulting from industrial, commercial, mining, or agricultural operations that is discarded or is being accumulated, stored or physically, chemically, thermally, or biologically treated prior to being discarded, recycled or discharged." In accordance with 40 CFR § 61.341, waste stream is defined as "the waste generated by the particular process unit, product tank, or waste management unit…. Examples of a waste stream include process wastewater, product tank drawdown, sludge and slop oil removed from waste management units, and landfill leachate."

The ethanol production process does not produce benzene. To transport the ethanol, ethanol plants are required by the United States Bureau of Alcohol, Tobacco, Firearms and Explosives to add gasoline to its product. The purchased gasoline may contain small quantities of benzene. 100% ethanol and gasoline are initially stored in separate storage tanks. The 100% ethanol and gasoline are mixed together generally at a ratio of 19 to 1 (i.e. 95% ethanol and 5% gasoline) to produce denatured ethanol and are stored in a storage tank. The denatured ethanol is then loaded into railcars or trucks to be shipped offsite.

As noted in the March 7, 1990, federal register, the sources of benzene waste the rule was based on at chemical plants are as follows: "Wastes that contain benzene are generated from raw materials, intermediates, and products that contain benzene at … chemical plants that use or produce benzene… Certain chemical plants use benzene as a raw material or produce it as a product or as a coproduct or by-product in processes that involve direct-contact with steam or cooling water. These processes generate wastewater, sludges, and organic liquid wastes that contain benzene." Based on the summary on the sources of benzene waste, ethanol plants do not meet the identified sources.

Gasoline or denatured ethanol, which includes amounts of benzene, would not be considered to meet this NESHAP's definition of waste until it is "discarded". For this to occur at an ethanol plant there would need to be a leak or a spill of the storage tanks or pipes between the tanks and loading racks. Upon collection of the gasoline or denatured ethanol from a spill, the material would then be classified as "remediation waste." However, remediation wastes are excluded from a facility's total annual benzene (TAB) calculation by this NESHAP to encourage facilities with a TAB less than 10 megagrams (10 tons) per year to undertake voluntary remediation actions.

The leak or spill of a storage tank would be maintained within a confined area. The leak or spill could then come into contact with rainwater to form an aqueous waste stream. However as noted in 40 CFR § 61.341, a stormwater waste stream is exempt from the standard. In addition as noted in the March 7, 1990, federal register, "Benzene in stormwater would result on an intermittent basis when spills or leaks are entrained by rainwater that falls at the facility. Existing regulations related to spills under both the CWA and RCRA should minimize the amount of benzene available for entrainment by storm water runoff. Because of this and considering that storm water runoff waste streams occur intermittently, EPA believes that on an annual average basis, benzene emissions from storm water will not contribute significantly to overall risk due to benzene emissions at a facility. Therefore, segregated storm water runoff is specifically excluded from today's benzene rule."

Even though NuGen may be considered a chemical plant under this rule because of its standard industrial classification code, NuGen is not applicable to this standard because of the following reasons:

1. NuGen does not produce a chemical as listed in the rule;
2. NuGen does not produce a waste stream identified in the rule making for chemical plants the rule was designed to cover;
3. NuGen potential benzene waste is either specifically exempt from the rule or is exempt from inclusion in the total annual benzene calculation to determine if controls are necessary; and
4. EPA did not identify this regulation as being applicable in other rule makings or in its enforcement documents for ethanol plants.

4.5 Maximum Achievable Control Technology Standards

DENR reviewed the Maximum Achievable Control Technology Standards under 40 CFR Part 63 and determined the following may be applicable to NuGen.

4.5.1 ARSD 74:36:08:11 – 40 CFR, Part 63, Subpart Q

The national emission standard for industrial process cooling towers prohibits the use of chromium based water treatment chemicals in industrial process cooling towers. NuGen uses two cooling towers in the production of ethanol. Since the compliance date for existing sources has passed, this rule does not apply provided no chromium based water treatment chemicals are used. If they are used, the source is in violation of this federal requirement.

In accordance with ARSD 74:36:05:04.01(8), a unit cannot be considered insignificant if a state or federal limit is applicable to the unit. The prohibition of chromium based water treatment chemicals is a limit. Therefore, the industrial process cooling tower cannot be considered insignificant activities and will be included in the permit.

4.5.2 ARSD 74:36:08:72 - 40 CFR, Part 63, Subpart FFFF

On November 10, 2003, EPA finalized this maximum achievable control technology standard. This rule applies to the following chemical processing plants:

1. Those facilities that produce chemicals classified using the 1987 Standard Industrial Classification Manual of a code indicated by 282, 283, 284, 285, 286, 287, 289, or 386; and
2. Those facilities that are a major source of hazardous air pollutants. A major source of hazardous air pollutants has the potential to emit 10 tons of a single hazardous air pollutant and/or 25 tons of all hazardous air pollutants;

NuGen's Standard Industrial Classification code is 2869, which falls underneath the code of 286. NuGen requested operational restrictions that maintain hazardous air pollutant emissions less than the major source threshold under the Title V air quality permit program. Taking this into account, NuGen is not applicable to this maximum achievable control technology standard.

4.5.3 ARSD 74:36:08:40 - 40 CFR 63 Subpart ZZZZ

The national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) is applicable to major and area sources of hazardous air pollutant emissions. A stationary RICE is any internal combustion engine which uses reciprocating motion to convert heat energy into mechanical work and which is not mobile.

A major source of hazardous air pollutant emissions is a plant site that emits or has the potential to emit any single hazardous air pollutant at a rate of 10 tons or more per year or any combination of hazardous air pollutants at a rate of 25 tons or more per year. An area source of hazardous air pollutant emissions is a source that is not a major source – emits less than 10 tons per year of any single hazardous air pollutant and less than 25 tons per year of any combination of hazardous air pollutants.

A stationary RICE located at an area source of hazardous air pollutant emissions is existing if construction or reconstruction of the stationary RICE occurred before June 12, 2006. A stationary RICE located at an area source of hazardous air pollutant emissions is new if construction of the stationary RICE occurred on or after June 12, 2006.

NuGen operates a 300 horsepower John Deere JW6H-UF40 diesel- fired fire pump engine that was constructed in June 2007. The engine is considered a new RICE located at an area source of hazardous air pollutant emissions. In accordance with 40 CFR § 63.6590(c), a new stationary RICE located at an area source of hazardous air pollutant emissions must meet the requirements of 40 CFR Part 60 Subpart IIII. No further requirements under this subpart apply to the stationary RICE.

4.6 State Requirements

Any source operating in South Dakota that meets the requirements of the Administrative Rules of South Dakota (ARSD) 74:36:05:03 is required to obtain a Title V air quality permit. Although NuGen accepted enforceable operational restrictions below the major source threshold under the Title V air quality permit program, NuGen must comply with federal new source performance standards and is required to obtain a Title V air quality permit in South Dakota.

4.6.1 Particulate and Sulfur Dioxide Emission Limits

ARSD Chapter 74:36:06 includes particulate and sulfur dioxide emission limits for fuel-burning units and processes. The following are the particulate and sulfur dioxide emission limits for fuel burning units derived from ARSD 74:36:06:02:

1. Particulate matter:
    a. A fuel-burning unit with heat input values less than 10 million Btus per hour may not exceed 0.6 pounds of particulate matter per million Btus of heat input; and

b. A fuel-burning unit with a heat input equal to or greater than 10 million Btus per hour may not exceed the particulate emissions rate determined by Equation 4-2.

Equation 4-2 – Particulate emission limit

$E = 0.811 \times H^{-0.131}$

Where

- E = the allowable particulate emissions rate in pounds per million Btus of heat input; and
- H = heat input in millions of Btus per hour.

2. A fuel-burning unit may not emit sulfur dioxide emissions to the ambient air in an amount greater than three pounds of sulfur dioxide per million Btus of heat input to the unit based on a three-hour rolling average, which is the arithmetic average of three contiguous one-hour periods.

The following are the particulate and sulfur dioxide emission limits derived for a process from ARSD 74:36:06:03:

1. Particulate matter:
   a. The allowable particulate emissions rate for processes with a process weight rate up to 60,000 pounds per hour shall be determined by using Equation 4-3; and
   b. The allowable particulate emissions rate for processes with a process weight rate in excess of 60,000 pounds per hour shall be determined by using Equation 4-4.

Equation 4-3 – Process rate up to 60,000 pounds per hour

$E = 4.10 \times P^{0.67}$

Where

- E = the allowable particulate emissions rate in pounds per hour; and
- P = process weight rate, in tons per hour.

Equation 4-4 – Process rate in excess of 60,000 pounds per hour

$E = (55.0 \times P^{0.11}) - 40$

Where

- E = the allowable particulate emissions rate in pounds per hour; and
- P = process weight rate, in tons per hour.

The following units are considered processes. In several cases the control device has more than one operation being controlled by the control device. In these cases, the operation that results in the more stringent particulate matter emission limit is used in establishing the particulate matter limit for processes and is identified in parentheses for the following units:

1. Unit #1 (168 tons per hour);
2. Unit #2 (168 tons per hour);
3. Unit #4 (186 tons per hour);;
4. Unit #5 (46.5 tons per hour); and
5. Unit #6 (500 tons per hour).

If a unit is a process that is also a fuel-burning unit, in accordance with ARSD 74:36:06:05, the more stringent particulate and/or sulfur dioxide emission limit is applicable. The air emissions from Unit #4 are generated from the burning of fuel and from the process itself. Therefore, the particulate and sulfur dioxide emission limits were calculated for both and the more stringent limits are applicable. In the case of sulfur dioxide, the emission limit for processes and fuel burning units is equivalent. On the particulate side, the more stringent interpretation is the process emission limit.

Unit #9 is considered a fuel-burning unit but because it's maximum design operating rate is less than 3.5 million Btus per hour the unit is not subject to the state particulate or sulfur dioxide emission limits.

The particulate and sulfur dioxide emissions from the ethanol load out flare (Unit #7) and the biomethanator flare (Unit #8) are produced from fuel burning equipment that would not have been permitted if the equipment was not a control device. The flares are required to meet the requirements in 40 CFR Part 60.18.

In addition to a particulate matter and sulfur dioxide emission limit, fuel burning units and processes are required to meet an opacity limit of 20% in accordance with ARSD 74:36:12:01. Based on past experience with NuGen's operations, NuGen is capable of meeting the state's opacity limit.

4.6.2 Performance Testing

Table 4-3 provides a summary of the most recent stack performance tests on each unit; but does not include the Relative Accuracy Test Audits for the nitrogen oxide continuous emission monitoring system.

Table 4-3 – Summary of Stack Performance Tests [1]

Unit	Date	TSP/PM10 (lbs/hr)	CO (lbs/hr)	SO_2 (lbs/hr)	VOCs (lbs/hr)	HAPS (tons/year)
#1	04/22/08	0.31	-	-	-	-
#2	04/21/08	0.06	-	-	-	-
#3	07/08/10	-	-	-	11.1 (833) [3, 4]	<0.989 [5, 6] (<4.3) [5, 7]
#4	07/20/10	5.3 (0.12) [1]	9.4 (0.21) [1]	0.40 (0.01) [1, 2]	0.45 (0.010) [1]	<0.96 (<2.07) [7, 8]
#5	06/26/07	0.21	-	-	-	-
#6	04/21/08	0.07	-	-	-	-

[1] – The emission rates in parentheses is in pounds per ton of dried distillers grain;
[2] – Stack test occurred on August 13, 2009;
[3] – Total volatile organic compound emissions determined by 40 CFR Part 60, Appendix A, Method 320, summing all detected compounds;
[4] – The emission rate is in pounds per million gallons produced;
[5] – Stack test occurred on June 25, 2008;
[6] – The emission rate is in pounds per hour;

[7] – The quantity in parentheses is for total hazardous air pollutants; and
[8] – Total volatile organic compound emissions determined by 40 CFR Part 60, Appendix A, Method 18/NCASI 94.02, summing all detected compounds.

There is no short term limit for hazardous air pollutants. The long term limit is established at 9.5 and 23.8 tons per 12-month rolling period for a single hazardous air pollutant and a combination of hazardous air pollutants, respectively. Table 4-3 demonstrates compliance with the long term limits for hazardous air pollutants.

Tables 4-4 and 4-5 provide a comparison of the short term emission limits with the most recent stack performance test results for criteria air pollutants.

Table 4-4 – Short Term Emission Limit Comparison for Particulate Matter

	TSP		PM10		PM2.5	
Unit	**Short Term**	**Stack Test**	**Short Term**	**Stack Test**	**Short Term**	**Stack Test**
#1	56.6 lbs/hr	0.3 lbs/hr	2.1 lbs/hr	0.3 lbs/hr	2.1 lbs/hr	0.3 lbs/hr
#2	56.6 lbs/hr	0.1 lbs/hr	1.2 lbs/hr	0.1 lbs/hr	1.2 lbs/hr	0.1 lbs/hr
#4	57.7 lbs/hr	5.3 lbs/hr	0.12 lbs/ton	0.12 lbs/ton	0.12 lbs/ton	0.12 lbs/ton
#5	43.9 lbs/hr	0.2 lbs/hr	0.6 lbs/hr	0.2 lbs/hr	0.6 lbs/hr	0.2 lbs/hr
#6	69.0 lbs/hr	0.1 lbs/hr	0.4 lbs/hr	0.1 lbs/hr	0.4 lbs/hr	0.1 lbs/hr

Table 4-5 – Short Term Emission Limit Comparison for CO, SO_2 and VOC

	CO		SO_2		VOC	
Unit	**Short Term**	**Stack Test**	**Short Term**	**Stack Test**	**Short Term**	**Stack Test**
#3	-	-	-	-	850 lbs/MMgals	833 lbs/MMgals
#4	0.45 lbs/ton	0.21 lbs/ton	0.45 lbs/ton	0.01 lbs/ton	0.13 lbs/ton	0.01 lbs/ton

In addition to stack testing, a visible emission test was performed on Unit #7 and #8 on July 24 and 25, 2008. The results of the test determined the flares were not emitting visible emissions (i.e., 0 percent opacity).

Based on the stack test results conducted since 2007, NuGen is in compliance with the short term limits accepted to avoid a Prevention of Significant Deterioration review and permit and the state's emission limits.

DENR is proposing to require NuGen to stack test for volatile organic compound emissions from Unit #3 and #4. NuGen shall conduct the performance test in accordance with 40 CFR Part 51, Appendix M; Method 207 and 40 CFR Part 60, Appendix A; Method 18. 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compounds in the sampling program (i.e., acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing. When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound mass as one half of the compound method detection limit; except that, if all three performance test runs result in a non-detect measurement and the method detection limit is less

than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero mass.

In addition, Unit #4 shall be stack tested for particulate matter 10 microns in diameter or less to demonstrate it is still in compliance with the short term limit. All other stack test results indicated the emissions rates were less than 50 percent of the short term limit and will not be required to stack test at this time.

4.6.3 Compliance Assurance Monitoring

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V air quality permit. NuGen's application was received in December 2010. Therefore, compliance assurance monitoring is applicable to any unit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;
2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

NuGen requested enforceable limits be placed in the permit to require their potential emissions be maintained less than the major source threshold under the PSD program. Currently those enforceable limits maintain actual emissions below 100 tons per year which is the major source threshold under the Title V air quality permit program. The compliance assurance monitoring program is subject to major sources receiving Title V air quality permits. NuGen is considered a minor source receiving a Title V air quality permit. Therefore, compliance assurance monitoring is not applicable to NuGen.

4.6.4 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the federal Clean Air Act. NuGen is required to meet particulate matter, sulfur dioxide, nitrogen oxide, volatile organic compound, carbon monoxide and hazardous air pollutant emission limits. To ensure these limits are maintained, the following periodic monitoring procedures are required.

Unit #1, #2, #4, #5, #6, and #9 are subject to periodic monitoring for particulate matter. Periodic monitoring for the units may consist of visible emission readings, pressure drop readings for the appropriate control device, or implementation of a maintenance plan for the appropriate control device. A permit condition will be placed in the permit requiring NuGen to perform periodic visible emission readings.

Units #3 and #4 are subject to periodic monitoring for volatile organic compounds and/or hazardous air pollutants. Periodic monitoring will consist of establishing and recording the water

flow rate of for the wet scrubber system and establishing and recording the temperature of the thermal oxidizer heat recovery boiler system.

Unit #4 is subject to periodic monitoring for sulfur dioxide emissions. The periodic monitoring for sulfur dioxide emissions is not required beyond the initial stack test. In addition, sulfur dioxide emissions normally consist of the sulfur content of the fuel fired in the units. Periodic monitoring for sulfur dioxide is not required for units that burn natural gas.

The equipment that is in volatile organic service will be subject to periodic monitoring for volatile organic compound leaks. The volatile organic compound emissions from equipment leaks are covered by the requirements of 40 CFR, Part 60, and Subpart VV, which is incorporated in the permit.

Unit #4 is subject to periodic monitoring for nitrogen oxide and carbon monoxide. Periodic monitoring for nitrogen oxide will consist of the continuous emission monitoring system for nitrogen oxide. Periodic monitoring for carbon monoxide will be based on monitoring the exhaust temperatures.

The flares on Unit #7 and #8 are used to reduce volatile organic compound emissions. Even though the flares do not have a specific volatile organic compound limit, to verify that the flares on Unit #7 and #8 are operating properly, the requirements in 40 CFR 60.18 will be used as periodic monitoring for its operations.

4.6.5 Air Fees

Title V sources are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants that are charged are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds and hazardous air pollutants. The actual emissions are calculated by DENR and are based on information provided by the source.

5.0 Recommendation

DENR will take this opportunity to remove permit conditions that are related to initial startup such as report, initial stack tests, etc. since they are no longer applicable.

DENR determined an error in the permit that needs to be corrected. In May 2010, when the permit for the modification to increase ethanol production was issued, the capacity of Unit #4 for the dried distillers grain and solubles dryers was listed at 42 tons per hour with a maximum heat input value of 46.5 million Btus per hour. The Statement of Basis drafted for the modification reviewed the increase in the dryers' capacities at 46.5 tons per hour; but there was no change to the maximum heat input value for the dryers. It should have stayed at 45 million Btus per hour. DENR will take this opportunity to correct this error.

The changes to the existing list of permitted units will be revised as shown in Table 5-1.

Table 5-1 – Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Grain receiving, grain transfer, and storage bin loading. Trucks and railcars transport grain to the ethanol plant and dump grain into a receiving pits located in a partially enclosed building. Elevator legs transport the grain from the receiving pit to grain storage bins. ~~Each leg has a capacity of 18,000 bushels/hour.~~	~~420 tons of grain per hour~~ **1,008 tons of grain per hour**	Baghouse
	Elevator legs transport the grain to a day bin by a conveyor and elevator leg	168 tons of grain per hour	
#2	Grain milling. The grain is transferred from the day bin to one of four hammer mills where the grain is milled into flour.	42 tons of grain per hour (each hammer mill)	Baghouse
	An elevator leg transfers the flour to the fermentation process	168 tons of flour per hour	
#3	Fermentation system. Ethanol is produced from the fermentation process. The fermentation process occurs in seven fermenters and the liquid beer is stored in a beer well.	91,500 gallons of mash per hour	Wet scrubber.
#4	Four DDGS dryers. The distillers grain and solubles is dried in two dryer systems. Each dryer system is comprised of two dryers operated in series. Each dryer has a multi cyclone to collect product and is fired on natural gas. A combination of flue gas recirculation and low NOx burners will be installed on the dryers and thermal oxidizer.	Each dryer has a heat input capacity of ~~46.5~~ **45** million Btus per hour and processes ~~42~~ **46.5** tons of DDGS per hour.	Two thermal oxidizer heat recovery boiler systems. Each thermal oxidizer has a maximum operating rate of 122 million Btus per hour heat input. ~~A combination of flue gas recirculation and low NOx burners will be installed on the dryers and thermal oxidizers.~~
	The thin stillage and solids fractions of the wet distillers grain and solubles are separated by six centrifuges		
	Distillation process. The distillation process distills the liquid beer. The distillation process consists of the beer stripper, rectifier, side stripper, molecular sieve, condensers, and evaporators.	14,400 gallons of ethanol produced per hour.	
	Process vent mixer, cook water tank, centrate tank, and yeast tank		
	Biomethanator. Methane produced by the biomethanator is either routed to Unit #7 or the DDGS dryers.		

Unit	Description	Maximum Operating Rate	Control Device
#5	Cooling drum. A cooling drum cools the dried distillers grain.	46.5 tons of dried distillers grain per hour	Baghouse. A portion of the exhaust gases may be passed through the DDGS dryer(s) in Unit #4
#6	Dried distillers grain silo	500 tons of dried distillers grain per hour	Baghouse
#7	Submerged truck loading rack	36,000 gallons of denatured ethanol per hour.	A flare. The flare has an operating rate of 12.4 million Btus per hour heat input
	Rail car loading rack	120,000 gallons of denatured ethanol per hour	
#8	Biomethanator Flare. Methane produced by the biomethanator is either routed to Unit #4 or the biomethanator flare.	6.4 million Btus per hour heat input	Not applicable
#9	Fire Pump. The fire pump is fired on distillate oil.	300 horsepower (~ 2.5 million Btus per hour heat input)	Not applicable
#10	Industrial cooling tower	Not applicable	Not applicable
#11	Tank #1 – An above ground storage tank with an internal floating roof. The tank will store ethanol.	200,000 gallons	Not applicable
#12	Tank #2 – An above ground storage tank with an internal floating roof. The tank will store ethanol.	200,000 gallons	Not applicable
#13	Tank #3 – An above ground storage tank with an internal floating roof. The tank will store gasoline.	200,000 gallons	Not applicable
#14	Tank #4 – An above ground storage tank with an internal floating roof. The tank will store denatured ethanol.	1,500,000 gallons	Not applicable
#15	Tank #5 – An above ground storage tank with an internal floating roof. The tank will store denatured ethanol	1,500,000 gallons	Not applicable

NuGen will be required to operate within the requirements stipulated in the following regulations:

- ARSD 74:36:05 - Operating permits for Part 70 sources;
- ARSD 74:36:06 - Regulated air pollutant emissions;
- ARSD 74:36:07 - New source performance standards;
- ARSD 74:36:08 - National emission standards for hazardous air pollutants;

- ARSD 74:36:11 - Performance testing;
- ARSD 74:36:12 - Control of visible emissions;
- ARSD 74:36:13 - Continuous emission monitoring systems; and
- ARSD 74:37:01 - Air pollution control program fees.

Based on the information submitted in the air permit application, DENR recommends conditional approval for a Title V air quality permit with operational limits that allow NuGen Energy to be exempt from a PSD review for particulate matter, sulfur dioxide, nitrogen oxide, volatile organic compounds, and carbon monoxide. Any questions pertaining to this permit recommendation should be directed to Keith Gestring, Engineer II.